Development of a metallostar MRI contrast agent based on a DTPA derivative of 8-hydroxy-quinoline

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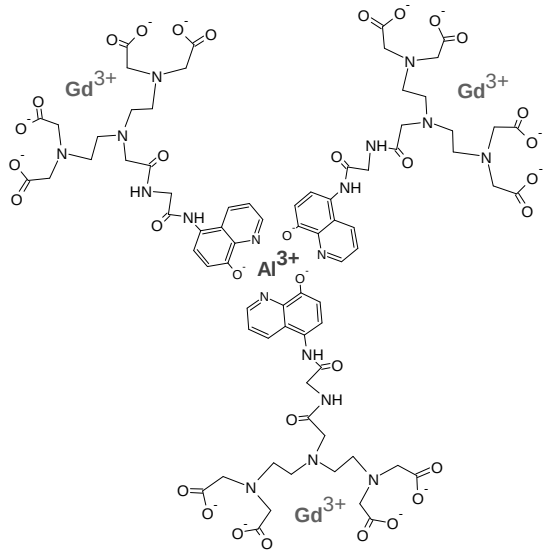
Magnetic resonance imaging (MRI) is routinely used as a diagnostic tool in various medical procedures. The gadolinium(III) complex of diethylene triamine pentaacetic acid (DTPA) and its derivatives are currently used as *in vivo* MRI contrast agents. In recent years there is much effort done in order to design contrast agents with improved efficiency and relaxivity, especially at higher magnetic fields. The use of slowly rotating macromolecular complexes causes the relaxivity to increase significantly.[1] A very promising class of contrast agents are the so-called **metallostars**.[2] These are rigid hetero-polymetallic complexes with a central p- or d-block metal ion and several peripheral lanthanide(III) ions. We synthesized and characterized a new metallostar with three peripheral gadolinium(III) ions and gallium(III) or aluminum(III) as the central ion.

The building up occurs by a self-assembly process using a ditopic ligand which contains two different binding sites for coordination of two different metal ions. This is realized by a DTPA derivative of 8-hydroxy-quinoline.



Structure of the metallostar compound built up with three Gd(III)-DTPA-quinoline moieties around a central Al(III) ion.

Characterization was done by ESI-MS, NMR spectroscopy, IR spectroscopy, UV-VIS and luminescence spectroscopy of which could be concluded that the complex formation and the self-assembly were successful.

For the development of the metallostar, a novel ditopic ligand was synthesized. The ligand contains a DTPA derivative as the binding unit for the lanthanide ion and a 8-hydroxy-quinoline for the coordination of Al(III) or Ga(III). The characterization studies show a clear indication for the formation of a supramolecular complex. Further studies towards the relaxivity, the biodistribution and the physico-chemical properties of the complex are under way.

[1] P. Hermann, J. Kotek, V. Kubiček, I. Lukeš, Dalton Transactions (2008), 3027-3047.
[2] T.N. Parac-Vogt et al, Contrast Media & Molecular Imaging (2006), **1**, 267-278.